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EXAMINER	
MATIN, NURUL M	
ART UNIT	**PAPER NUMBER**
2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/501,049	KOKKONEN, MIKKO	
	Examiner	Art Unit	
	Nurul M. Matin	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 April 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *38-75* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *38-54,56-73 and 75* is/are rejected.

7)☒ Claim(s) *55 and 74* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *07/09/2004*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawing (fig.3) is objected to under 37 CFR 1.83(a) because it fails to show "second output 210" as described in the specification on page 3, Para [0039], line 18. Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement-drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

2. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

a) The abstract is objected for using the word "said". For example, said receiver, said plurality, said processing, said signals, said estimate.

b) The abstract is objected for using the word "means". For example, processing means,

Response to Arguments

3. Applicant's arguments, see remarks, filed 04/23/2007 with respect to the rejection(s) of claim(s) 38-54 and 56-74 under 102(b) and 103 have been fully considered and are persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Cheong, WO 00/52845, Hafeez et al, US 6304618 and Rudrapatna, US 2002/0132600.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 38-50, 52-53, 56-69, 71-72, 75 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hafeez et al, US 6304618, in view of Rudrapatna, US 2002/0132600 and further in view of Cheong, WO 00/52845.

Re claim 38, Hafeez discloses a receiver configured to receive a plurality of signals, said receiver comprising: a plurality of receiving elements each of which is configured to receive a composite signal including at least some of said plurality of signals (col.4, line 25- 35, "Digital information symbols a.sub.1 (n) are passed to a transmitter 102a, which converts the symbol stream into a radio waveform for transmission using antenna 104a. A second transmitter 102b converts a second independent symbol stream a.sub.2 (n) into a radio waveform for transmission using antenna 104b. The two radio signals occupy the same frequency band, though with a possible small frequency offset, and are received by antenna 106. It will be understood that although a single antenna 106 is illustrated, multiple antennas such as diversity antennas may be used"); processor configured to receive said plurality of receiving elements composite signal and providing an estimate of at least two of said plurality of signals (fig.1). But Hafeez fails to disclose that the receiver receives said plurality of signals at the same time; said processor is configured to provide an estimate of a first

one of said signals and then to provide an estimate of a second one of said signals wherein said processor is configured, for each already determined estimate to extend the estimate with a plurality of potential values, wherein said estimate of said second one of said signals takes into account the estimate of the first signal and the estimate of the first signal is modified in dependence on the estimate of the second signal. However, Rudrapatna does teach the receiver receives said plurality of signals at the same time(page 1, Para [0006], line 1-7, "Another technique used with antenna arrays is called multiple input multiple output (MIMO). Unlike spatial diversity techniques wherein a group of antennas is used to transmit (or receive) a single signal, MIMO techniques use an antenna array coupled to a signal processing device (including transmission and reception circuitry) to simultaneously transmit and/or receive multiple distinct signals. But Hafeez and Rudrapatna fail to teach processor is configured to provide an estimate of a first one of said signals and then to provide an estimate of a second one of said signals wherein said processor is configured, for each already determined estimate to extend the estimate with a plurality of potential values, wherein said estimate of said second one of said signals takes into account the estimate of the first signal and the estimate of the first signal is modified in dependence on the estimate of the second signal. However, Cheong does teach processor is configured to provide an estimate(decoder) of a first one of said signals(page 22, line 14-15, " the first decoder 700 is configured to calculate the expected value for each of the symbols in the primary data signal x1") and to provide an estimate of a second one of said signals (" second decoder 702 is configured to calculate the expected value for each of the

symbols in the superimposed cross talk signal x2") wherein said processor is configured, for each already determined estimate to extend the estimate with a plurality of potential values, wherein said estimate of said second one of said signals takes into account the estimate of the first signal(page 22, line 22-23, " the expected values computed by the first decoder 700 are arranged to be inputted into the second decoder 702") and the estimate of the first signal is modified in dependence on the estimate of the second signal(page 22, line 23-24, " the expected values computed by the second decoder 702 are arranged to be inputted into the first decoder 700").

Therefore, taking the combined teaching of Hafeez, Rudrapatna and Cheong as a whole, it would have been obvious to one of ordinary skill in the art to incorporate the arrangement of the receiver receives said plurality of signals at the same time as thought in Rudrapatna into Hafeez so that multiple antenna system that can operate in either multiple input multiple output (MIMO) mode, a beam forming/steering mode or a diversity mode (summery of the invention), and also the arrangement of processor is configured to provide an estimate of a first one of said signals and then to provide an estimate of a second one of said signals wherein said processor is configured, for each already determined estimate to extend the estimate with a plurality of potential values, wherein said estimate of said second one of said signals takes into account the estimate of the first signal and the estimate of the first signal is modified in dependence on the estimate of the second signal as thought in Cheong into Hafeez and Rudrapatna to reduce the impact of cross talk interference in multi-carrier data transmission systems(summery of the invention).

Re claim 39, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, and Cheong reference also teaches processor is configured to provide an initial estimate of said plurality of signals, said processor using said initial estimate as a first value for said first and second estimates (fig. 3: 303, page 11, line 1-10).

Re claim 40, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, Cheong reference also teaches processor is configured to provide an estimate of at least three signals (xl, x2, y) and the estimate of each successive signal takes into account the previously determined signal estimates (fig. 1, page 8, line 25-9, "the cross talk interference may also be simultaneously received from two or more specific transmitters), for example, a third signal emanating from an end user 118C may also be superimposed on the first signal xl").

Re claim 41, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, Cheong reference also teaches processor is configured to provide an estimate of at least three signals and any one or more of the previously determined estimated can be modified in dependence on a current signal estimate (fig. 1, page 8, line 25-29, "a third signal emanating from an end user 118C may also be superimposed (or modified) on the first signal xl").

Re claim 42, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, and Cheong reference also teaches processor is configured to determine the order in which the signals are estimated (page 4, line 8, page 10, line 5, it shows that signals are estimated one after another or in order).

Re claim 43, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 42, Cheong reference also teaches processor is configured to determine the order in which the signals are estimated taking into account at least one of received signal level and signal to noise ratio (fig. 6, page 20, line 6-32, "the line monitor determines the noise level, gain and phase shift on each of the subchannels. The object is to estimate the signal-to-noise ratio for each of the subchannels").

Re claim 44, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, Cheong reference also teaches potential values comprise constellation points (page 17, line 8-12, "although only a 2 bit [as potential values] output constellation is shown and described, it should be noted that this is not a limitation and that other output constellation could be used").

Re claim 45, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 44, and Cheong reference also teaches estimate is extended by every possible constellation point (page 17, line 8-12, and "estimate is extended as the constellation point is increasing For example, a 4 bit constellation, 5 bit constellation, a 6 bit constellation and the like").

Re claim 46, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, Cheong reference also teaches plurality of potential values comprise potential values for a currently estimated signal (fig. 7, page 22, line 12-20, "decoder (means estimation) 700 is arranged to compute a probability distribution P1 for each of the possible values for the primary data signal xl and decoder 702 is arranged

to compute a probability distribution P2 for each of the possible values for the superimposed cross talk signal x2").

Re claim 47, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, and Hafeez reference also teaches a metric is determined for the extended estimates (col. 2, line 40-45) in which a channel estimates are produced for the plurality of transmitted signals, and metrics are computed using the sample streams and the channel estimates.

Re claim 48, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 47, and Hafeez reference also teaches at least some of said extended estimates are discarded in dependence on the determined metric (Hafeez, col. 3, line 6-10, "the information symbols may be detected by storing path information that is associated with a plurality of paths, and extending the paths by hypothesizing symbol values and computing metrics. Paths may be discarded based on the metrics").

Re claim 49, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 47, and Hafeez reference also teaches that one or more existing estimates are discarded if a determined metric is better than that of said one or more existing estimates (col. 3, line 38-49, "the channel estimates may be initialized for the plurality of transmitted channels and the metrics may be initialized for the sample streams based on the known information symbols").

Re claim 50, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 47, and Hafeez reference also teaches a metric is based on a function

of the currently determined estimates and the received signal (Hafeez, col. 3, line 25-26, " the metrics are computed using the received signal and the channel estimates").

Re claim 52, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 47, and Hafeez reference also teaches a metric is calculated for a signal estimate at least partially from metric values stored during the calculation of a previously determined estimate (Hafeez, col. 2, line 65-67, col. 3, line 1-5, " the metrics may be computed by estimating received values using the channel estimates and the hypothesized symbol, and computing the metrics using the estimated received values").

Re claim 53, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, Cheong reference also teaches processor is configured to treat those signals for which an estimate has not yet been determined as noise. Here basically it says we need the processor for the signal to get the noise, which is well known, in the art.

Re claim 56, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, and Hafeez reference also teaches receiving elements comprise antennas (Hafeez, col. 4, line 25-30, "a second transmitter 102b converts a second independent symbol stream a2 (n) into a radio waveform for transmission using antenna 104b").

Re claims 57-69, 71-72, 75, which recite limitations encompassed in claims 38-50, 52-53.

Therefore, claims 57-69, 71-72, 75, have been analyzed and rejected with respect to claims 38-50, 52-53.

6. Claims 51 and 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hafeez et al, US 6304618, Rudrapatna, US 2002/0132600, Cheong (WO 00152845) and in view of Decker et al, US 4980897.

Re claim 51, the combined teaching of Hafeez, Rudrapatna and Cheong as a whole fail to teach that a function is a squared Euclidean distance between said currently determined estimates and the received signal. However, Decker discloses that a function is a squared Euclidean distance between said currently determined estimates and the received signal (fig. 11, col. 12, line 3-12, in which a multi-channel trellis decoding consists of 2 basic steps: finding the squared Euclidean distance of the received point to the nearest neighbor in each subset).

Therefore, the combined teaching of Hafeez, Rudrapatna, Cheong and Decker as a whole would have rendered obvious using the squared Euclidean distance between said currently determined estimates and the received signal as thought in Decker into Hafeez, Rudrapatna and Cheong for the benefit of the performing maximum likelihood sequence estimation.

Re claim 70, which recite limitations encompassed in claim 51. Therefore, claim 70 has been analyzed and rejected with respect to claim 51.

7. Claims 54 and 73 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hafeez et al, US 6304618, Rudrapatna, US 2002/0132600, Cheong (WO 00152845) and in view of Zeira, US 2002/0006122.

Re claim 54, Hafeez, Rudrapatna and Cheong references teach a receiver as claimed in claim 38, and Hafeez reference also teaches the processor (fig. 1) is configured, before determining any estimates to calculate at least one of: the matrix product of the channel transfer function multiplied by itself (fig. 8. col. 5, line 51-65); the squared length of the channel impulse response for at least one signal received by at least one receiving element (fig. 5. col. 7, line 49-56). But, the combined teaching of Hafeez, Rudrapatna and Cheong as a whole, fail to teach that an inner function defined by the received signal multiplied by the channel impulse response. However, Zeira teaches that an inner function defined by the received signal multiplied by the channel impulse response (col. 7, Para [0052], in which the channel response [overcome (h)] are obtained successively by an inner product or function of successive rows of T with the average of W-length segments of the received vector [overscore(r)].

Therefore, the combined teaching of Hafeez, Rudrapatna, Cheong and Zeira as a whole would have rendered obvious the limitations of: an inner function defined by the received signal multiplied by the channel impulse response as claimed as thought in Zeira into Hafeez, Rudrapatna and Cheong to calculate every burst stored in the burst buffer so that the survivor processor takes input from the burst buffer and the survivor buffer and for each survivor calculates the quantity.

Re claim 73, which recite limitations encompassed in claim 54.

Therefore, claim 73 has been analyzed and rejected with respect to claim 54.

Allowable Subject Matter

Claims 55 and 74 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nurul M. Matin whose telephone number is 571-270-1188. The examiner can normally be reached on mon-fri (7:30-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Nurul Matin
Assistance Examiner, Art Unit # 2611

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SUPERVISORY PATENT EXAMINER